UNCONVENTIONAL OIL AND GAS DEVELOPMENT
BIBLIOGRAPHY

April 2018 Monthly Update

This bibliography includes:

- Literature compiled by the Health Effects Institute Special Scientific Committee on Unconventional Oil and Gas Development as it developed its October 2015 Research Agenda on the Potential Impacts of 21st Century Oil and Natural Gas Development in the Appalachian Basin and Beyond. Given its specific charge, the Committee focused its literature review on information related to potential impacts of 21st century oil and natural gas development rather than the enormous literature about the technology that underlies it. In the Research Agenda and here, “21st century oil and natural gas development” refers to the onshore development and production of oil and natural gas from unconventional geologic resources as practiced today, recognizing that industry practices continue to change in response to evolving technologies, regulations, and other factors. The Committee gave priority to peer-reviewed articles from the scientific literature as well as to reports and data from nongovernmental research institutions and government agencies with knowledge of and expertise about oil and natural gas development and production in the Appalachian region. Despite this focus on the Appalachian region, much of this bibliography is relevant to other regions in the United States and around the world.

~ We welcome your suggestions of papers that should be included. Please send to dvorhees@healtheffects.org ~
# TABLE OF CONTENTS

## STRESSOR AND EXPOSURE CHARACTERIZATION

- STRESSOR IDENTIFICATION AND PROPERTIES ................................................................. 5
  - Drilling Fluid Composition ......................................................................................... 5
  - Hydraulic Fracturing Fluid Composition ................................................................ 5
  - Wastewater Composition .......................................................................................... 7
  - Solid Waste Composition .......................................................................................... 11
  - Naturally Occurring Radioactive Material (NORM) .................................................... 11
  - Air Quality Emission Inventories .............................................................................. 12
  - Reviews and General Resources ............................................................................ 13

## STRESSOR FATE AND TRANSPORT

- Forensics/Tracers ........................................................................................................ 14
- Atmospheric Transport ................................................................................................ 14
- Surface Releases (Liquid and Solid Waste Products) .................................................... 14
- Subsurface Migration .................................................................................................. 15
- Hydraulic Fracturing Depth and Fracture Propagation (as it relates to Ground Water Quality) .................................................. 16
- Reviews and General Resources ............................................................................ 17

## AIR QUALITY

- Methane ...................................................................................................................... 17
- Ozone .......................................................................................................................... 21
- Radiation ..................................................................................................................... 22
- Monitoring Methods and Protocols .......................................................................... 22
- Monitoring Data and/or Modeling ............................................................................ 23
  - Appalachia ................................................................................................................ 23
  - Colorado/Southwest .................................................................................................. 25
  - North Dakota .......................................................................................................... 26
  - Texas ......................................................................................................................... 26
  - Utah and Wyoming .................................................................................................. 27
  - U.S. Multi-Regional or National Scale ..................................................................... 28
- Reviews and General Resources ............................................................................ 28

## WATER QUALITY AND USE

- Surface Water Quality Baseline Measurements ......................................................... 30
- Surface Water Quality Monitoring and/or Modeling .................................................. 30
- Drinking Water Quality (sourced from groundwater or surface water) ....................... 33
  - Arkansas ................................................................................................................. 33
  - Appalachia ................................................................................................................ 33
  - Colorado .................................................................................................................. 35
  - Texas ......................................................................................................................... 36
  - Wyoming .................................................................................................................. 36
- Ground Water Quality Baseline Measurements ............................................................ 36
- Ground Water Quality Modeling and/or Monitoring .................................................... 38
  - Appalachia ................................................................................................................ 38
  - Canada ..................................................................................................................... 39
  - Colorado and Wyoming .......................................................................................... 39
  - Montana ................................................................................................................... 40
  - Texas ......................................................................................................................... 40
- Water Use .................................................................................................................... 40
- Reviews and General Resources ............................................................................ 43
Oil and Gas Resource Assessments ................................................................. 122
Geology/Hydrogeology .................................................................................. 123
Energy Outlooks .............................................................................................. 123
Guidance Documents ..................................................................................... 124
Data Availability, Transparency, and Community Engagement .................. 125
STRESSOR AND EXPOSURE CHARACTERIZATION

STRESSOR IDENTIFICATION AND PROPERTIES

Drilling Fluid Composition


Hydraulic Fracturing Fluid Composition


**Wastewater Composition**


Haluszczak LO, Rose AW, Kump LR. 2013. Geochemical evaluation of flowback brine from Marcellus gas wells in


4/28/2018


Solid Waste Composition


Naturally Occurring Radioactive Material (NORM)


Doyi I, Essumang DK, Dampare S, Glover ET. 2016. Technologically enhanced naturally occurring radioactive


Air Quality Emission Inventories


Reviews and General Resources


Forensics/Tracers


Atmospheric Transport


Surface Releases (Liquid and Solid Waste Products)


**Subsurface Migration**


Flewelling SA, Sharma M. 2014. Response to Rozell on “Constraints on Upward Migration of Hydraulic Fracturing


Hydraulic Fracturing Depth and Fracture Propagation (as it relates to Ground Water Quality)


Reviews and General Resources


**AIR QUALITY**

Methane


Lavoie TN, Shepson PB, Cambaliza MOL, Stirm BH, Karion A, Sweeney C, et al. 2015. Aircraft-based


Sheng JX, Jacob DJ, Maasakkers JD, Sulprizio MP, Zavala-Araiza D, Hamburg SP. 2017. A high-resolution (0.1 degrees x 0.1 degrees) inventory of methane emissions from Canadian and Mexican oil and gas systems. Atmospheric Environment 158:211-215.


Ozone


Radiation


Monitoring Methods and Protocols


**Monitoring Data and/or Modeling**

**Appalachia**


West Virginia Department of Environmental Protection Office of Oil and Gas. 2013. Air Quality Impacts Occurring from Horizontal Well Drilling and Related Activities. Charleston, WV: West Virginia DEP.

West Virginia Department of Environmental Protection Office of Oil and Gas. 2013. Noise, Light, Dust, and Volatile Organic Compounds Generated by the Drilling of Horizontal Wells Related to the Well Location Restriction Regarding Occupied Dwelling Structures. West Virginia Department of Environmental Protection-Office of Oil and Gas. Charleston, WV.

**Colorado/Southwest**


Grant J, Parikh R, Bar-Ilan A. 2018. Future year 2028 emissions from oil and gas activity in the greater San Juan basin and Permian basin-draft report. RAMBOL.


North Dakota


Texas


Rich AL, Orimoloye HT. 2016. Elevated atmospheric levels of benzene and benzene-related compounds from unconventional shale extraction and processing: human health concern for residential communities. Environ Health Insights 10:75–82.


Utah and Wyoming


**U.S. Multi-Regional or National Scale**


**Reviews and General Resources**


Allen DT. 2016. Emissions from oil and gas operations in the United States and their air quality implications.


Pirzadeh P, Lesage KL, Marriott RA. 2014. Hydrophatic fracturing additives and the delayed onset of hydrogen sulfide


WATER QUALITY AND USE

Surface Water Quality Baseline Measurements


Surface Water Quality Monitoring and/or Modeling


Medina VF, Suedel B. 2015. Evaluation of Hydraulic Fracturing (Fracking) Plays for Potential Impact on USACE-


sites in Denton County, Texas, USA. Environmental Geology 55:1463–1471.


Drinking Water Quality (sourced from groundwater or surface water)


Arkansas


Appalachia


**Colorado**


4/28/2018
HEI'S ENERGY RESEARCH PROGRAM

Literature Update

Hei’s Energy Research Program

4/28/2018

36


Texas


Wyoming


Ground Water Quality Baseline Measurements


Ground Water Quality Modeling and/or Monitoring

**Appalachia**


Canada


Colorado and Wyoming


Stephens DB. 2015. Analysis of the groundwater monitoring controversy at the Pavillion, Wyoming natural gas

**Montana**


**Texas**


**Water Use**


Wilkins RF, Menefee AH, Clarens AF. 2016. Environmental life cycle analysis of water and CO2-based fracturing fluids used in unconventional gas production. Environmental science & technology.


Reviews and General Resources


Younger PL. 2016. How can we be sure fracking will not pollute aquifers? Lessons from a major longwall coal

SOIL QUALITY


SEDIMENT QUALITY


FOOD QUALITY

CHEMICAL STRESSOR TOXICITY

Drilling Fluids


Hydraulic Fracturing Fluids


**Wastewater**


HUMAN EXPOSURE

Personal Exposure Monitoring


On-site and Fenceline Air Quality Monitoring


Crowe E, Patton S, Thomas D, Thorpe B. 2016. When the Wind Blows: Tracking Toxic Chemicals in Gas Fields

---

1 Also see the air quality sections, which include numerous studies that are relevant to human exposure.


Rich AL, Orimoloye HT. 2016. Elevated atmospheric levels of benzene and benzene-related compounds from unconventional shale extraction and processing: human health concern for residential communities. Environ Health Insights 10:75–82.


West Virginia Department of Environmental Protection Office of Oil and Gas. 2013. Air Quality Impacts Occurring from Horizontal Well Drilling and Related Activities. Charleston, WV: West Virginia DEP.

West Virginia Department of Environmental Protection Office of Oil and Gas. 2013. Noise, Light, Dust, and Volatile Organic Compounds Generated by the Drilling of Horizontal Wells Related to the Well Location Restriction Regarding Occupied Dwelling Structures. West Virginia Department of Environmental Protection-Office of Oil and Gas. Charleston, WV.

Outdoor Air Quality Monitoring (Beyond the Fenceline)


Indoor Air Quality Monitoring


Surface Water Quality Monitoring


Penningroth SM, Yarrow MM, Figueroa AX, Bowen RJ, Delgado S. 2013. Community-based risk assessment of
HEI’S ENERGY RESEARCH PROGRAM  
Literature Update


Drinking Water Monitoring


4/28/2018


Groundwater Monitoring


Soil and Sediment Monitoring


### Biomonitoring


### Exposure Pathway Reviews


Yost EE, Stanek J, Burgoon LD. 2017. A decision analysis framework for estimating the potential hazards for drinking water resources of chemicals used in hydraulic fracturing fluids. Sci Total Environ. Insert complete reference

HEALTH AND WELL-BEING

Ecological Health
Public Health
Oil and Gas Worker Health
Individual and Community Well-Being
ECOLOGICAL HEALTH


Grant CJ, Lutz AK, Kulig AD, Stanton MR. 2016. Fracked ecology: Response of aquatic trophic structure and


Meng Q. 2016. The impacts of fracking on the environment: A total environmental study paradigm. Sci Total


Shank MK. 2013. The Pennsylvania State University.


PUBLIC HEALTH

Human Health Risk Assessment and Human Health Impact Assessments


Public Safety


Epidemiology


Gulland A. 2016. Fracking is linked to asthma increase, study finds. Bmj-British Medical Journal 354.


Reviews of Potential Public Health Impacts and Recommendations for Future Research


Bechtel DG, Waldner CL, Wickstrom M. 2009. Associations Between In Utero Exposure to Airborne Emissions...


Krupnick AJ, Echeta I, Zachary L, Raimi D. 2017. WHIMBY (What’s Happening in My Backyard?): A Community Risk-Benefit Matrix of Unconventional Oil and Gas Development. Available from


Mickley SE. 2017. Health and well-ness: Analysis of key public health indicators in six of the most heavily drilled marcellus shale counties in pennsylvania. Lehigh Valley, PA.


**Community-Engaged Research (Perception, Symptoms, and Other Anecdotal Information)**

Andrade A, Carrera T, Martinez F, Pantoja L, Rubens M, Zerecero E. Urban oil drilling and community health: Results from a UCLA health survey UCLA Institute of Environment and Sustainability.


Environ Eng 50:473–481.


**General Resources and Guidance**


Finkel ML, Hays J. 2015. Environmental and health impacts of ‘fracking’: why epidemiological studies are necessary. J Epidemiol Community Health


OIL AND GAS WORKER HEALTH


Assessment.


Occupational Safety and Health Administration. 2018. Preventing hearing loss caused by chemical (ototoxicity) and noise exposure. 2018-124.Occupational Safety and Health Administration Centers for Disease Control and Prevention.


INDIVIDUAL AND COMMUNITY WELL-BEING2


---

2This category excludes articles that are explicitly health related (e.g., community perceptions of health impacts), which can be found in the “General Health” Section.


Fernando FN, Cooley DR. 2016. Socioeconomic system of the oil boom and rural community development in Western North Dakota. Rural Sociol; doi: 10.1111/ruso.12100.


MOST EFFECTIVE PRACTICES

Waste Management
Induced Seismicity
Wellbore Integrity and Diagnostics
WASTE MANAGEMENT

General Information


Transport


Treatment and Reuse


Erkenbrecher CW, Nurnberg S, Breyla AD. 2015. A comparison of three nonoxidizing biocides and chlorine dioxide


Silva JM, Gettings RM, Kostedt WL, Watkins VH. 2014. Produced Water from Hydrofracturing: Challenges and


---

INDUCED SEISMICITY


Davies R, Foulger G, Bindley A, Styles P. 2013. Induced seismicity and hydraulic fracturing for the recovery of


van der Baan M, Calixto FJ. 2017. Human-induced seismicity and large-scale hydrocarbon production in the USA and Canada. Geochemistry, Geophysics, Geosystems:n/a-n/a.


WELLBORE INTEGRITY AND DIAGNOSTICS

(LAST UPDATED OCTOBER 2015)

Modeling


Well Material Performance under Simulated Conditions


Integrity Monitoring and Analysis of Barrier Failure Data


General Resources and Guidance – Wellbore Integrity and Diagnostics


ADDITIONAL INFORMATION

Multi-Discipline Reviews and Research
Recommendations
Economics
Regulation
Background Material
MULTI-TOPIC REVIEWS AND RESEARCH RECOMMENDATIONS


---

**ECONOMICS**


Nandakumar N, Annaswamy AM. 2017. Impact of increased renewables on natural gas markets in eastern United


REGULATION


Agency SABUEP. 2016. SAB Review of the EPA’s draft Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources. 1-180.


Ryder SS, Hall PM. 2017. This land is your land, maybe: A historical institutionalist analysis for contextualizing split estate conflicts in US unconventional oil and gas development. Land Use Pol 63:149-159.


BACKGROUND MATERIAL

Fact Sheets and General Information


Technology


Oil and Gas Resource Assessments


Geology/Hydrogeology


Energy Outlooks


Guidance Documents


Occupational Safety and Health Administration. 2018. Avoiding underground utilities during horizontal directional drilling operations.


Data Availability, Transparency, and Community Engagement


